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THE SOLUBILITY OF CHROME YELLOW IN THE GASTRIC JUICE.

BY PROF. L. E. SAYRE.

It has hitherto been advanced as an opinion among physiologists, that the chromate of lead is non-toxic in property. This belief has been based almost wholly upon the supposed insolubility of the salt in the gastric fluid and other fluids of the intestinal tract.

This subject has been recently revived, and much prominence given to it by several cases of alleged lead-poisoning, from the use of chromate of lead, in Philadelphia. It appears that the bakers in that city have been using this salt quite freely as a pigment. To give certain cakes a peculiar yellow color, they have used chromate of lead instead of the yolk of eggs. Children, and others, who have indulged in the use of these products of the bakery, have become victims of lead poisoning, and in some cases death has been the final result of long-continued use of such adulterated food.

I need not speak of these cases in detail, but will briefly refer to a verdict of the coroner's jury in the cases of four persons who died from supposed lead poison, on various dates.

This jury stated that the deaths, in their opinion, were due to chromate-of-lead poisoning, and that this poisoning resulted from the use of chromate of lead "as a coloring matter in buns and other breadstuffs."

Investigators have again taken up the subject, and have arrived at somewhat conflicting conclusions. One states that these cases were those of chronic lead-poisoning, and not due to the presence of chromic radical in the least. It is stated further that chrome dyes have been in general use since 1828 at least, thousands of tons being consumed annually in America alone, and that it is important to note that there is not known to exist among the workers in any of the forms of chrome colors any chrome disease or chrome poisoning from contact, from inhalation, or otherwise. Another, a physician, states that any of the modifications of chromium may be poisonous, and cites four cases where poisoning occurred from the use of insoluble salts of chromic acid.

It is well known that the gastric fluid is an acidulated solution, and as a solvent it has a comparatively wide range of action. It contains about two-tenths per cent. of acid. The digestive principle contained in the gastric fluid is recognized as *pepsin*. It is possible to make an artificial gastric juice by separating the digestive principle from the inner lining of the stomach and making an acidulated solution of it.

My experiments with lead chromate consisted of making an *artificial* gastric fluid, and macerating in this fluid at the temperature of 100° F. a certain quantity of commercial chromate of lead and noting the effect.

It is known that any metallic substance, if it enters into solution, will very markedly impair the digestive action of artificial gastric fluid. Lead salts will absolutely destroy digestive action. If, therefore, after digesting chromate of lead in the gastric fluid the action of the fluid is at all impaired, it is a positive evidence that the salt has gone, to some extent at least, into solution.

Thirty grains of chromate of lead were mixed with one fluid ounce of artificial gastric fluid, the digestive strength of which had been carefully noted. It was found that the digestive action had been slightly impaired, but not enough to account for lead chromate entering into solution, for the slightest quantity of a lead salt will produce a marked impairment.

Subsequently I prepared a chemically pure chromate of lead, and experimented

with it in the same way. I found that the pure salt did not interfere in any way with the digestive action of the fluid, and therefore the inference is that the pure salt is insoluble in the gastric fluid. An analysis was made of the fluid after it had been standing at 100° F. in contact with the pure chromate; no reaction indicating the presence of the salt could be obtained.

Prof. E. H. S. Bailey has since examined the commercial chrome yellow, and finds it to contain variable quantities of barium and calcium sulphate. The latter salt is sufficiently soluble to account for the above modified action of the digestive fluid.

Dr. Marshall, of Philadelphia, has made some physiological experiments upon dogs which lead him to believe that chrome yellow is decomposed by the muriatic acid of the stomach. The so-called poisonous property cannot be due to the solubility of the salt, but it might be accounted for by the gradual decomposition of the salt in the tissues, which retain considerable portions of the insoluble powder.

ON THE OCCURRENCE OF NITRITES IN RAIN-WATER.

BY PROF. G. H. FAILYER.

As a part of our work upon the nitrogen compounds occurring in rain-water we have tested qualitatively for nitrites, using the test proposed by Griess and modified by Warrington.* The test is almost too delicate to be used quantitatively, but in all cases we tried to grade the color produced by a purely artificial scale; such as faint, distinct, strong, very strong. In general, as might be expected, the depth of color produced varies inversely with the amount of rain, since the first portion of the fall would serve to wash the air, and any subsequent fall would only dilute the solution. But the amount of this has been quite variable, for extremely heavy rains have sometimes shown good reactions. This may be due to the production of nitrites during the shower, or, in a long-continued rain, the air being renewed at any one place may bring in fresh supplies of the salts.

To illustrate the results obtained, I give a summary for the year justclosed (Oct. 1886 to Sept. 1887, inclusive.)

<i>Month.</i>	<i>No. of rains...</i>	<i>No. giving reaction.....</i>	<i>No. giving no reaction..</i>	<i>Doubtful.....</i>
October.....	2	2	.....	.....
November.....	2	2	.....	.....
December.....	3	3	.....	.....
January.....	3	3	.....	.....
February.....	3	1	.....	2
March.....	6	.....	4	2
April.....	5	.....	2	3
May.....	8	8	.....	.....
June.....	10	7	2	1
July.....	12	12	.....	.....
August.....	7	7	.....	.....
September.....	8	4	2	2
.....	3	3	.....	.....
Total.....	69	49	10	10

It seems remarkable that so many of the rain-waters should show the presence of nitrites. It is equally remarkable that the winter months should be deficient in these compounds. Is it because oxidation is then at a minimum, or is it that reduc-

* See Journal of the London Chem. Soc. for May, 1881.